Macbeth®
PROCESS MEASUREMENTS
A DIVISION OF KOLLMORGEN CORPORATION

Transmission Densitometer TD-931

Operator's Manual

IMPORTANT SAFEGUARDS

WHEN USING YOUR MACBETH INSTRUMENT AND ASSOCIATED EQUIPMENT, BASIC SAFETY PRECAUTIONS SHOULD ALWAYS BE FOLLOWED, INCLUDING THE FOLLOWING:

1. READ AND UNDERSTAND ALL INSTRUCTIONS.

2. CARE MUST BE TAKEN AS BURNS CAN OCCUR FROM TOUCHING HOT PARTS.

3. DO NOT OPERATE APPLIANCE WITH A DAMAGED CORD OR IF THE APPLIANCE HAS BEEN DROPPED OR DAMAGED - UNTIL IT HAS BEEN EXAMINED BY A QUALIFIED SERVICEMAN.

4. DO NOT LET CORD HANG OVER EDGE OF TABLE OR COUNTER OR TOUCH HOT SURFACES.

5. IF AN EXTENSION CORD IS NECESSARY, A CORD WITH A SUITABLE CURRENT RATING SHOULD BE USED. CORDS RATED FOR LESS AMPERAGE THAN THE APPLIANCE MAY OVERHEAT. CARE SHOULD BE TAKEN TO ARRANGE THE CORD SO THAT IT WILL NOT BE TRIPPED OVER OR PULLED.

6. ALWAYS UNPLUG APPLIANCE FROM ELECTRICAL OUTLET WHEN NOT IN USE. NEVER YANK CORD TO PULL PLUG FROM OUTLET. GRASP PLUG AND PULL TO DISCONNECT.

7. LET APPLICANCE COOL COMPLETELY BEFORE PUTTING AWAY. LOOP CORD LOOSELY AROUND APPLIANCE WHEN STORING.

8. TO PROTECT AGAINST ELECTRICAL SHOCK HAZARDS, DO NOT IMMERSE THIS APPLIANCE IN WATER OR OTHER LIQUIDS.

9. TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT DISSASSEMBLE THIS APPLIANCE, BUT TAKE IT TO A QUALIFIED SERVICEMAN WHEN SOME SERVICE OR REPAIR WORK IS REQUIRED. INCORRECT RE-ASSEMBLY CAN CAUSE ELECTRIC SHOCK WHEN THE APPLIANCE IS SUBSEQUENTLY USED.

10. SAVE THESE INSTRUCTIONS.

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OPERATOR'S MANUAL FOR MACBETH TD-931 TRANSMISSION DENSITOMETER

ISSUE DATE: SEPTEMBER 1984

TD-931

The TD-931 is a black and white transmission densitometer for Graphic Arts use. The filter, apertures and functions provided in this instrument will give accurate information of the type required in this application.

SPECIFICATIONS

Power Requirements :

Voltage Ranges : 105-130V, 50/60HZ., or 210-260V, 50/60 HZ, or 90-110V, 50/60HZ. (the appropriate range is marked on the back of the unit).

Current at 125V : .40 amps

Full Performance Temperature Range : 10°-40° C

Spectral Response : Orthochromatic

Measuring Range :

Density: Ortho	0.00 -4.00D
Expanded density:	0.000-.999D
Percent Dot Area (1-%T)	0 to 100%
Accuracy:	±.02D
Repeatability:	±.01D
Apertures:	1,2,3,mm

DENSITOMETER AC POLARITY REQUIREMENTS

Macbeth densitometers are equipped with an earth ground pin on all line cord plugs. The electronic design of the densitometer incorporates an earth ground as part of the electronic system. All AC wall power receptacles must also be properly wired with respect to polarity and have an earth ground. If you are in doubt about your wall AC power connections, you can purchase an AC phasing circuit tester from a good electrical or electronic supply distributor. Approximate cost is $16.00.

CAUTION

To insure proper operation and safety, this ground pin must not be removed. Removal of the connections can damage and cause the instruments to malfunction. Also if the unit is touched and the person operating it touches something else which is metal, the current will flow through that person to ground.

EXPLANATION

If a unit is not grounded properly, a voltage spike on the AC line can cause the ground reference to go between .8 volts and 2 volts—this is referred to as being undefined in electronics. If it is either a high (2 to 5 volts) or a low (0 to .8 volts), this will cause the components to have either high or low states at random, causing erratic operation, loss of memory or total failure.

DIGITAL DISPLAY INFORMATION CODES

CCC

Three C's appear in the display whenever you attempt to take readings without having first zeroed the instrument.

CALIBRATION

Warning: Before turning on the unit, make sure that the line voltage being used and the voltage rating for the unit are the same.

1. Turn the unit on using the rocker switch on the back panel; the light in the density button should come on.

2. In the density mode, with no sample over the aperture, depress the snout and hold it down. With the snout down, press the "zero" button; ".000" will appear in the display.

NOTE

When you zero the instrument on a material whose density is greater than air (which is .000) and then measure a material whose density is less than that on which you zeroed the unit, the display will show negative density (9.99 or less) with no polarity (+ or -) showing.

The remaining steps of the Calibration Procedure need only be performed periodically:

3. Place the calibration standard provided over the reading aperture.

4. Depress the snout, and while holding it down, adjust the "CAL" control (located on the back panel) until the displayed reading matches the value on the calibration standard. This completes the calibration procedure.

OPERATION

DENSITY MODE (0.00): Take density readings as follows:

1. Press the Density button; the light in the button should come on.

2. Place the sample over the aperture.

3. Depress the snout to read.

DENSITY MODE (.000): To take density readings to three decimal places, up to densities of .999, depress the Density button a second time. If you attempt to read a density above .999 in this mode, the unit will "auto range" and display only two decimal places (example: 1.24). Operation is the same as in the Density 0.00 mode. To return to the Density 0.00 mode of operation, push the button again.

OPERATION (cont.)

% DOT MODE: To use the % Dot Mode, proceed as follows:

1. Press the % Dot Mode button; the light in the button should come on. In this mode the densitometer measures black dot area (1-% transmittance).

2. The densitometer should be zeroed on a fringe or "ghost" dot. To obtain the most accurate readings, find the step of a test exposure that has the highest density still containing fringe dots. The next higher exposure should have a hard dot in every position. Fringe dots are fuzzy and of low density where the dot should be. There may be small black dots in the center of some of the fringe dots.

NOTE: The instrument must be properly zeroed to read correctly.

3. Place the area of the film with the fringe dots over the reading area of the densitometer. Depress the snout and while holding it down, press the "zero" button to give a displayed reading of "000". The densitometer is now ready to measure % dot.

4. To read, place the sample over the aperture and depress the snout.

OPERATOR MAINTENANCE

Warning: Before performing any maintenance on the densitometer, make sure that the unit is unplugged. Failure to unplug the unit could result in personal injury, and damage the instrument.

FUSE REPLACEMENT: To replace the fuse in the unit, unscrew the red center section of the fuse holder. Replace the fuse with the appropriate part listed below.

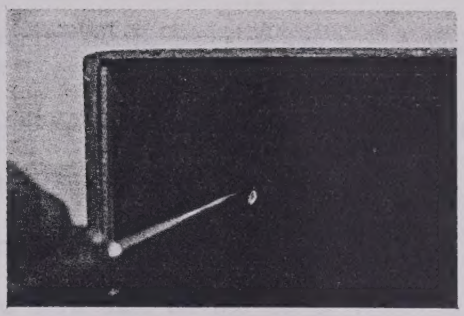
NOTE: Do not replace the fuse with one with a higher rating. If a replacement fuse blows immediately, do not replace it a second time until the cause has been isolated and corrected.

Unit Voltage	Macbeth Part No.	Description
110 VAC	31007000	¾ AMP #3 AG, Slo Blo
220 VAC	31003000	⅜ AMP #3 AG, Slo Blo

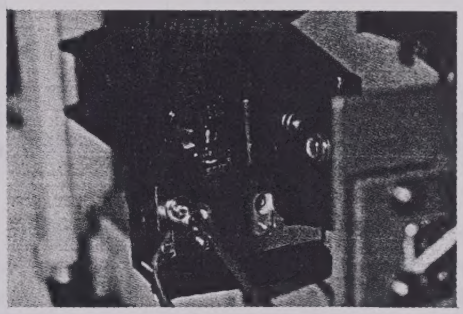
OPERATOR MAINTENANCE (cont.)

LAMP REPLACEMENT: To replace the lamp in the unit, first make sure the power cord is not plugged in. Then proceed as follows:

1. Remove the bottom cover by unscrewing the four screws in the feet.



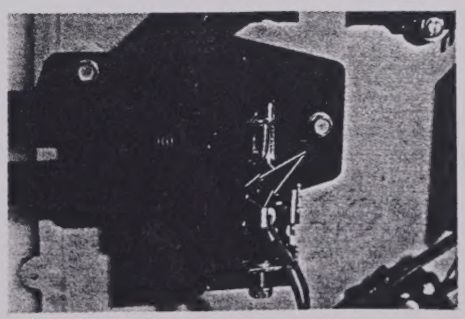
2. Loosen the two screws which hold the lamp tightly in place.



3. Pull the old lamp out of the socket.

4. Replace the lamp with an identical lamp, Macbeth part no. 30950000. **DO NOT TOUCH THE BULB WITH YOUR FINGERS;** use a piece of paper wrapped around the bulb to hold it with. If you do touch the bulb, use alcohol to clean it. Failure to do so will shorten the life of the lamp. Push the lamp so that it is solid in the socket.

5. Retighten the two small screws which hold the lamp tightly in place. Make sure the two metal plates at the base of the lamp to which these screws are attached are in the position shown.



6. Replace the bottom cover. This procedure is now completed.

OPERATOR MAINTENANCE (cont.)

CLEANING: Periodically, the lens directly under the stage plate should be cleaned. To do this, proceed as follows.

1. Remove the four screws which hold the plastic stage in place. The stage is the rectangular white plastic piece which contains the aperture.
2. The lens immediately below the aperture is the one which should be cleaned.
3. First, use a can of compressed air to blow the dust off the lens.
4. Next, use alcohol and lens tissue to gently clean the lens.
5. Use the can of compressed air to blow dust off the mirror which is directly under the lens assembly. **DO NOT TOUCH THE MIRROR,** as it is easily damaged.
6. Replace the stage plate and screws.

If there is a very noticeable film on the mirror which is not removed by air, the mirror should be cleaned **VERY GENTLY** with distilled water and lens tissue. DO NOT APPLY PRESSURE when using the lens tissue; this mirror should only be cleaned if absolutely necessary, as it is damaged VERY easily.

TRANSMISSION SPARE LAMP: A spare lamp for the transmission optical system is provided with the instrument and is located inside the instrument base. For lamp replacement, see the "lamp replacement" procedure above. Be sure to re-order replacement lamps for future use; average lamp life is 1000 hours. Additional lamps (Macbeth Part #30950000) can be purchased from Macbeth or your dealer.

BCD OUTPUT KIT:

If you wish to connect the densitometer directly to a computer, printer, or other device, a BCD Kit is available from Macbeth. Using this kit, density values can be output from the densitometer. The part number for the Macbeth BCD Kit is 59000560.

1000

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